

REMARKS

I. INTRODUCTION

The Office Action mailed on December 7, 2005 and the references cited therein have been carefully studied and, in view of the foregoing amendments and the following remarks, reconsideration and allowance of this application are most respectfully requested.

Claims 18-37 are currently pending. The Examiner has objected to claims 18 and 30, rejected Claims 26 and 30-37 under 35 U.S.C. §112 second paragraph, and rejected claims 18-37 under 35 U.S.C. §103. By the current amendment, claims 18, 26 and 30 have been amended. Applicants respectfully submit that the pending claims are in condition for allowance.

II. CLAIM OBJECTIONS

Claims 18 and 30 are objected to for certain informalities and are amended herein changing the word "A" to "An".

III. REJECTIONS UNDER 35 U.S.C. § 112

The Examiner has rejected claim 26 under 35 U.S.C. §112, second paragraph, as being indefinite as "the metal layer" lacks positive antecedent support in claim 18. Applicants have amended claim 26 and respectfully submit that claim 26 is now in compliance with 35 U.S.C. §112, second paragraph.

IV. REJECTIONS UNDER 35 U.S.C. § 103

The Examiner has rejected claim 18-37 under 35 U.S.C. §103(a) as being unpatentable over Forrest et al. (WO 00/11725) in view of certain additional references. The

references cited by the Examiner in combination with Forrest et al. are Sato et al. (U.S. Patent 4,479,028) and Hanak et al. (U.S. Patent 4,316,049) (claims 18,19, 22-25, and 29); Sato et al., Hanak et al. and Peumans et al. (Applied Physics Letters, vol. 76(19), pp. 2650-2652, May 8, 2000) (claims 20 and 21); Sato et al., Hanak et al. and Pettersson et al. (Journal of Applied Physics, vol. 86(1), pp. 487-496, July 1, 1999) (claims 27 and 28); Sato et al., Hanak et al. and Lewis (U.S. Patent 4,771,321) (claims 18, 19, 22-26, 29, 30, 33 and 37); Sato et al., Hanak et al., Lewis, and Peumans et al. (claims 20, 21, 31 and 32); Sato et al., Hanak et al., Lewis, and Pettersson et al. (claims 27, 28, 35, and 36); and Sato et al., Hanak et al., Lewis, and Aratani et al. (U.S. Patent 5,854,139)(claim 34). It is respectfully submitted that these rejections should be withdrawn for at least the following reasons.

To render a claim obvious, the prior art must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Moreover, obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the modification must be found in the prior art and not in the Applicants' disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

The present invention is directed to organic photosensitive optoelectronic devices comprising multiple stacked subcells in series between an anode and a cathode, wherein each adjacent subcell is separated by an electron-hole recombination zone. Applicants respectfully submit that the references cited by the Examiner do not teach or suggest all of the limitations of the presently pending claims.

The primary reference asserted by the Examiner is Forrest et al. The Examiner alleges that Forrest et al. discloses an electron-hole recombination zone, stating that “[b]etween each of the subcells is a semitransparent metallic layer of for example, 10% Ag and 90% M, which has a thickness of 100 Angstroms or less (see page 34, line 12 through page 35, line 26.” Applicants respectfully submit that the section of Forrest et al. referred to by the Examiner does not disclose an electron-hole recombination zone. Rather, the section referred to by the Examiner relates to a stacked device in which each subcell is separated by electrodes. The “thin semitransparent metallic layers” of Forrest et al. are part of a compound cathode, rather than an electron-hole recombination zone as asserted by the Examiner, as can be seen from the following passages from Forrest et al.

“Since the subcells are deposited back-to-back, all electrodes within the stack, i.e., 802b, and 805a and 805b, are contacts to two different subcells and the entire stack arrangement is electrically connected in parallel.”
Forrest et al. page 34, lines 10-13 (Emphasis added).

“Figure 8C depicts a series connected device 8C00 with intervening electrodes.... In another embodiment (not shown) which is a variant of 8C00, the metallic/non-metallic composite cathode is utilized by inserting thin semitransparent metallic layers of, e.g., 10% Ag in 90% Mg, or other low work function metals or metal alloys. These metallic layers of, approximately 100 Å or less in thickness, are placed below and adjacent to the metal substitute, e.g., ITO, layers 805a, 802b, 805b and 802c to form a metallic/non-metallic composite cathode for each subunit.”
Forrest et al. page 35, lines 13-26 (Emphasis added).

In the optoelectronic devices of the present invention, the individual subcells (which are each comprised of an electron donor layer and an electron acceptor layer) are

separated by an electron-hole recombination zone which serves to prevent the formation of a reverse heterojunction between adjacent subcells. The effective electron-hole recombination that occurs at the electron-hole recombination zone allows a photo-induced current to traverse the device. Page 14, lines 17-23. Thus, the electron-hole recombination zone(s) is distinct from electrodes, as electrodes, or contacts, are layers that provide a medium for delivering photo-generated charge carriers to an external circuit. Page 15, lines 10-15. Applicants respectfully submit that Forrest et al. does not teach or suggest the electron-hole recombination zone of the present invention.

Sato et al. does not cure the deficiencies of Forrest et al. Sato et al. does not teach or suggest organic photosensitive optoelectronic devices comprising multiple stacked subcells in series, wherein each adjacent subcell is separated by an electron-hole recombination zone. Sato et al. is directed to inorganic amorphous silicon-based devices rather than the organic devices of the present invention. Further, Sato et al. does not teach or suggest the use of an electron-hole recombination zone.

Hanak et al. also does not cure the deficiencies of Forrest et al. Hanak et al. does not teach or suggest organic photosensitive optoelectronic devices comprising multiple stacked subcells in series, wherein each adjacent subcell is separated by an electron-hole recombination zone. Hanak et al. is directed to inorganic amorphous silicon-based devices rather than the organic devices of the present invention. Further, Hanak et al. does not teach or suggest the use of an electron-hole recombination zone in an organic photosensitive optoelectronic device comprising multiple stacked subcells.

Peumans et al. also does not cure the deficiencies of Forrest et al. as it does not teach or suggest the use of an electron-hole recombination zone.

Pettersson et al. also does not cure the deficiencies of Forrest et al. Pettersson et al. does not teach or suggest organic photosensitive optoelectronic devices comprising multiple stacked subcells in series, wherein each adjacent subcell is separated by an electron-hole recombination zone. Rather, Pettersson et al. is directed to a single cell and not a stacked subcell device.

Aratani et al. also does not cure the deficiencies of Forrest et al. Aratani et al. does not teach or suggest organic photosensitive optoelectronic devices comprising multiple stacked subcells in series, wherein each adjacent subcell is separated by an electron-hole recombination zone. Aratani et al. is directed to a field-effect transistor for use in a liquid crystal display, rather than an organic photosensitive optoelectronic device. Further, Aratani et al. does not teach or suggest the use of an electron-hole recombination zone in an organic photosensitive optoelectronic devices.

Lewis also does not cure the deficiencies of Forrest et al. Lewis does not teach or suggest organic photosensitive optoelectronic devices comprising multiple stacked subcells in series, wherein each adjacent subcell is separated by an electron-hole recombination zone and wherein current generated in the first subcell and the current generated in the second subcell differ by less than about 10 %.

Furthermore, Applicants respectfully submit that there is no motivation to combine the cited references in the manner suggested by the Examiner in an attempt to arrive at the present claims. Applicants respectfully submit that the references cited by the Examiner lack the requisite motivation to combine that is needed to satisfy a case of *prima facie* obviousness. It is impermissible within the framework of § 103 to pick and choose from a reference only so much of it as will support a conclusion of obviousness, to the

exclusion of other parts necessary to a full appreciation of what the reference fairly suggests to one skilled in the art. *Bausch & Lomb, Inc. v. Barnes-Hind Hydrocurve, Inc.*, 230 U.S.P.Q. 416, 420 (Fed. Cir. 1986). For prior art references to be combined to render obvious a subsequent invention under §103, there must be something in the prior art as a whole which suggests the desirability, and thus the obviousness, of making the combination. *Uniroyal v. Rudkin-Wiley*, 5 U.S.P.Q.2d 1434, 1438 (Fed. Cir. 1988). Hindsight is strictly forbidden. For many of the claims, up to four separate references are combined in order to allegedly arrive at the presently claimed invention. The Examiner does not cite to any specific motivation within the references themselves that would support the combination of those references in the manner proposed by the Examiner. Moreover, many of the references are from different technical fields or are addressing the solution of an unrelated problem. For example, Sato et al. and Hanak et al. are directed to *inorganic* amorphous silicon-based devices rather than *organic* photosensitive optoelectronic devices. Thus, Applicants respectfully submit that there would be no motivation to combine the disclosures of Sato et al. and/or Hanak et al. with the disclosure of Forrest et al. Also, Aratani et al. is directed to a field-effect transistor for use in a liquid crystal display, rather than an organic photosensitive optoelectronic device.

For at least the above reasons, Applicants respectfully submit that the references cited by the Examiner, either alone or in combination, do not teach or suggest each of the limitations of the present claims. Furthermore, there is no motivation to combine the cited references to arrive at the claimed invention. Thus, Applicants respectfully submit that the rejections under 35 U.S.C. §103(a) be withdrawn.

V. DOUBLE PATENTING

The Examiner has rejected claims 18-37 on the grounds of nonstatutory obvious-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 6,657,378. Applicants submit herewith a terminal disclaimer filed in accordance with 37 C.F.R. § 1.321 in order to overcome these obviousness-type double patenting rejections. Applicants respectfully submit that this obviousness-type double patenting rejections has been overcome and should therefore be withdrawn.

The Examiner has also rejected claims 18-37 on the grounds of nonstatutory obvious-type double patenting as being unpatentable over claims 1-26 of U.S. Patent No. 6,198,091 and claims 1-27 of U.S. Patent No. 6,198,092. Applicants respectfully submit that the pending claims are patentably distinct from claims 1-26 of U.S. Patent No. 6,198,091 and claims 1-27 of U.S. Patent No. 6,198,092. Each subcell of the stacked devices of claims 1-26 of U.S. Patent No. 6,198,091 and claims 1-27 of U.S. Patent No. 6,198,092 has a cathode and an anode. Thus, the subcells of claims 1-26 of U.S. Patent No. 6,198,091 and claims 1-27 of U.S. Patent No. 6,198,092 can not be separated by an electron-hole recombination zone of the present claims. As the pending claims are patentably distinct from claims 1-26 of U.S. Patent No. 6,198,091 and claims 1-27 of U.S. Patent No. 6,198,092, Applicants respectfully submit that this rejection should be withdrawn.

The Examiner has provisionally rejected claims 18-37 on the grounds of nonstatutory obvious-type double patenting as being unpatentable over claims 1-31 of copending Application Serial No. 10/822,744. In support of his position, the Examiner states

[a]lthough the conflicting claims are not identical, they are not patentably distinct from each other because note in claim 30 of said copending

application that the first organic layer (i.e., first subcell) and second organic layer (i.e., second subcell) can contribute the same amount of photocurrent to the device. Office Action of December 7, 2005, page 16.

Applicants respectfully submit that the pending claims are patentably distinct from claims 1-31 of copending Application Serial No. 10/822,744 for at least the following reasons.

Counter to the assertions of the Examiner, the first organic layer of claims 1-31 of Application Serial No. 10/822,744 is a single layer and is a "mixture of an organic acceptor material and an organic donor material." This is distinct from the subcells of the present claims which comprise two layers -- an electron donor layer and an electron acceptor layer. The second organic layer of claims 1-31 of Application Serial No. 10/822,744 is also a single layer and is an unmixed layer of the organic donor material or the organic acceptor material. This is also distinct from the subcells of the present claims which comprise an electron donor layer and an electron acceptor layer. Thus, the claims of Application Serial No. 10/822,744 are not directed to a stacked device comprising multiple subcells. As the pending claims are patentably distinct from claims 1-31 of Application Serial No. 10/822,744, Applicants respectfully submit that this rejection should be withdrawn.

The Examiner has provisionally rejected claims 18-37 on the grounds of nonstatutory obvious-type double patenting as being unpatentable over claims 1-32 of copending Application Serial No. 10/910,371. In support of his position, the Examiner states

[a]lthough the conflicting claims are not identical, they are not patentably distinct from each other because note in claim 7 of said copending application that the first organic layer (i.e., first subcell) and second organic layer (i.e., second subcell) can contribute the same amount of

photocurrent to the device. Office Action of December 7, 2005, page 16-17.

Applicants respectfully submit that the pending claims are patentably distinct from claims 1-32 of copending Application Serial No. 10/910,371 for at least the following reasons.

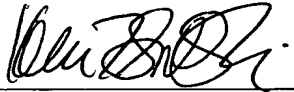
Counter to the assertions of the Examiner, the first organic layer of claims 1-32 of Application Serial No. 10/910,371 is a single layer and is a "mixture of an organic acceptor material and an organic donor material." This is distinct from the subcells of the present claims which comprise two layers -- an electron donor layer and an electron acceptor layer. The second organic layer of claims 1-32 of Application Serial No. 10/910,371 is also a single layer and is an unmixed layer of the organic donor material or the organic acceptor material. This is also distinct from the subcells of the present claims which comprise an electron donor layer and an electron acceptor layer. Thus, the claims of Application Serial No. 10/910,371 are not directed to a stacked device comprising multiple subcells. As the pending claims are patentably distinct from claims 1-32 of Application Serial No. 10/910,371, Applicants respectfully submit that this rejection should be withdrawn.

VI. CONCLUSION

Applicants respectfully submit that the pending claims are in condition for allowance and request that such action be taken. If for any reason the Examiner believes that prosecution of this application would be advanced by contact with the Applicants' attorney, the Examiner is invited to contact the undersigned at the telephone number below.

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Respectfully submitted,
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